2014 Missouri Department of Conservation
Oak Mast Survey Report

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BACKGROUND

Oak mast is a very important source of fall and winter food for many species of wildlife, particularly in the heavily forested portions of the state. Fluctuations in mast production can exert a strong influence on wildlife species that depend on mast crops for food. Poor mast years have resulted in lowered reproductive success in wildlife species, which can reduce the size of wildlife populations. Conversely, good mast years can improve individual fitness and overwinter survival of wildlife species, which, in turn, can increase wildlife population size. Mast crops can influence fall and winter wildlife movement as well. In areas with a poor mast crop or during poor mast years, some wildlife species will travel a greater distance in search of food and are more likely to feed around agricultural areas and forest edges, rather than the forest interior. Enhanced hunter success has been attributed to increased movement of game species during years of lower acorn abundance. Additionally, mast production is essential to the regeneration of important hardwood species, such as the oaks, and the many benefits they provide.

The Missouri Department of Conservation has conducted an annual survey of mast production since 1960. The majority of these data have been collected in oak-hickory forests located in five regions of central and southern Missouri (Figure 1). Individual, mature (i.e., potentially seed-producing) oaks are visually rated according to the number of developing acorns in crowns and classified as supporting high, moderate, low, or few to none. A mast production index (MPI) is generated from these data to provide an estimate of the availability of oak mast, giving MDC and the public an indication of what is in store for mast-dependent forest wildlife during fall and winter. The 2014 survey was carried out voluntarily by MDC Forestry Division staff. Information on mast production is used by resource managers, the news media, and the public, particularly hunters. These data were used recently to test associations between acorn production and recruitment of deer and turkey as well as hunter success.

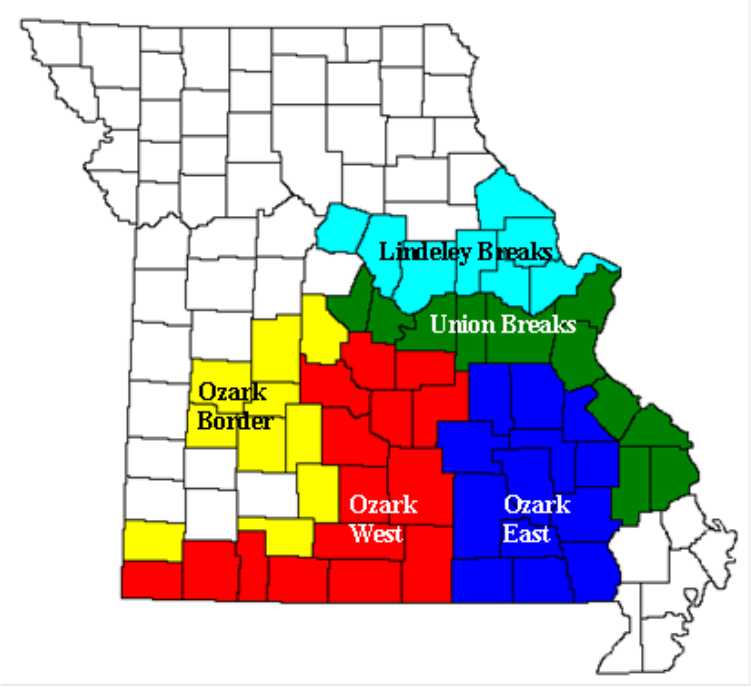

Figure 1. Five oak mast regions captured by MDC annual mast survey

RESULTS

Statewide

In 2014, a total of 5,196 oak trees were sampled by MDC staff – 2,549 trees from the red oak group and 2,647 trees from the white oak group. For the second straight year, mast production of all oaks was fair to marginally good (Table 1) with a mast production index (MPI) of 149 (Figure 2a). This represents a decrease of less than 1% from 2013 (MPI = 150) and an increase of 13% over the 54-year average (MPI = 132). Red oak mast production for 2014 was good (MPI = 159; Figure 2b), which is up 6% from last year's production (MPI = 150) and 17% above the long-term average (136) for the group. This year's white oak mast production was fair (MPI = 139; Figure 2c) and down 8% from 2013 (MPI = 151). White oak MPI for 2014 was 11% above the long-term average of 126 for the group. Mast production in 2014 was up 13%, 18%, and 18% for all oaks, red oaks, and white oaks, respectively, relative to the 5-year average (2010-2014).

Table 1. Rating system for classifying mast production.

Rating	MPI range
Poor	0-75
Fair	76-150
Good	151-225
Excellent	226-300

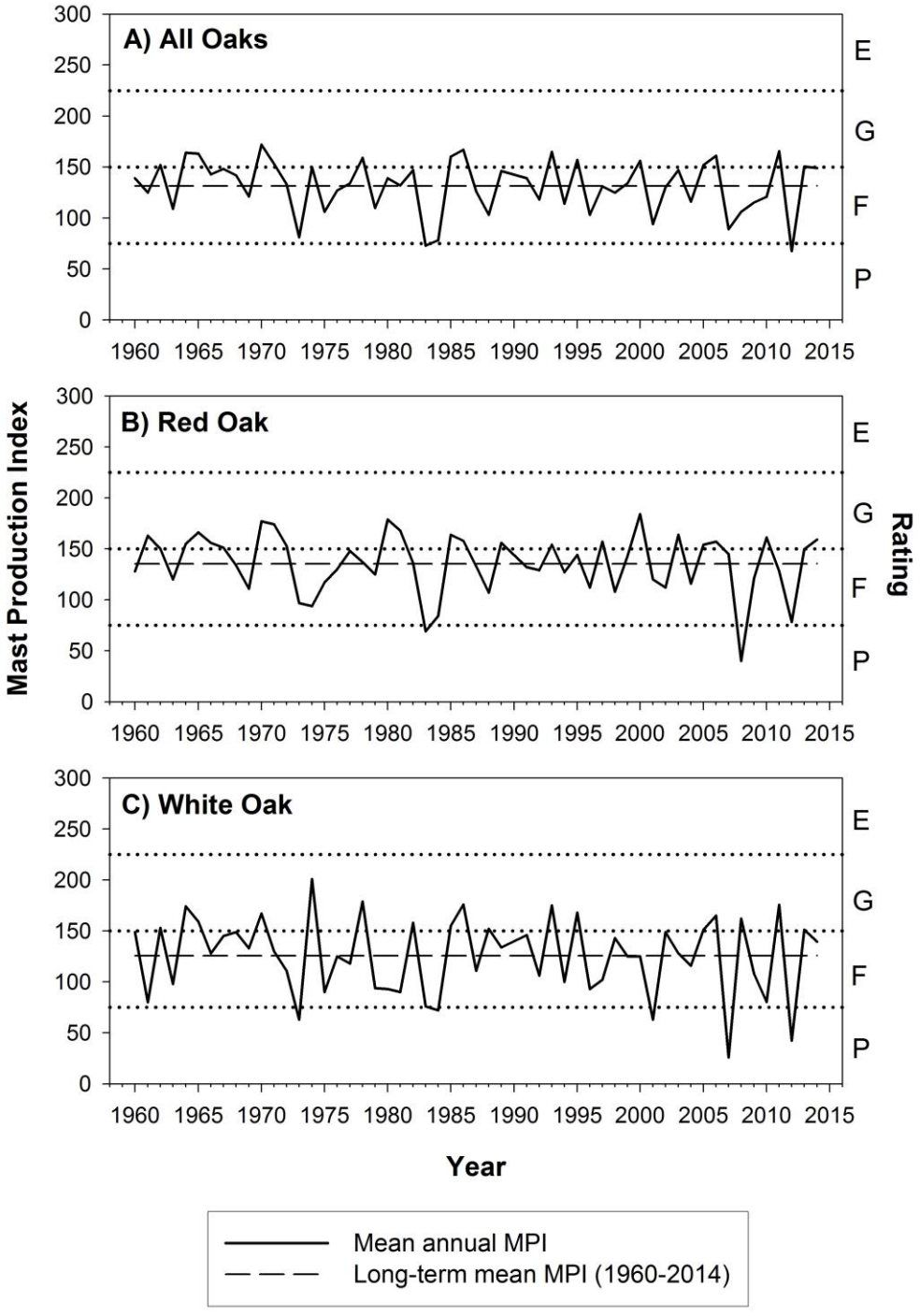

Figure 2. Statewide mean annual mast production indices for a) all oak, b) red oak, and c) white oak groups from 1960-2014 with 54-year average for reference. Dotted lines are breaks between mast production ratings which are: E=excellent, G=good, F=fair, and P=poor.

Regional

Red and white oak mast production in 2014 varied regionally from fair to good and, with the exception of white oak in the Ozark East region, exceeded the 54-year average in all regions. Good production of red oaks was registered in Ozark Boarder, Union Breaks, and Lindley Breaks regions, while white oaks had good production in the Ozark West region only. The highest production by red oaks was in the Lindley Breaks region (MPI = 197) and by white oaks in the Ozark West region (MPI = 152; Table 2). The Lindley Breaks region was the top producer of acorns for the second straight year. Regional changes in mast production from 2013 ranged from -10% to +13% for red oaks and -22% to +12% for white oaks; meanwhile, gains in mast production relative to long-term averages were observed, ranging from 3-45% for red oaks and <1-35% for white oak. For red oak species, the largest gain relative to 2013 in mast production occurred in the Lindley Breaks region and the only decrease in the Ozark East region. For white oaks, the only gain from 2013 production was observed in the Ozark West region and the largest decrease in the Ozark East region.

Table 2. Regional indices by red oak and white oak species groups from 2010-2014 and 54-year average for reference (μ).

	Ozark Border		Ozark West		Ozark East		Union Breaks		Lindley Breaks	
Year	Red oak	White oak	Red oak	White oak	Red oak	White oak	Red oak	White oak	Red oak	White oak
2010	117	54	160	102	169	92	173	57	187	97
2011	135	193	122	198	119	174	148	153	138	176
2012	65	31	77	37	64	38	114	77	85	45
2013	153	144	143	136	147	152	170	162	175	175
2014	161	136	146	152	132	118	184	137	197	145
μ	*141*	*133*	*139*	*131*	*128*	*118*	*136*	*127*	*136*	*107*

DISCUSSION & CONCLUSIONS

The results of the 2014 MDC mast survey indicated that acorn production was fair to good at state and regional scales and exceeded the 54-year average in most cases. Red oak production was good at the state level and for most regions, while white oak production was fair. This year's total acorn production (i.e., all oaks combined) was comparable to estimates for 2013, but considerably greater than 2012 estimates, the lowest recorded in the 54-year history of the mast survey.

This year's above-average acorn production was likely associated with milder weather over the last two years. According to a recent report from the State Climatologist, Missouri has experienced cooler weather since the spring of 2013, and the first 9 months of 2014 rank as the 9th coolest on record (since 1895) and the coolest since 1979. Growing season precipitation was above-average during 2013. In 2014, growing season precipitation has been more variable with less rain in the south and more to the north. However, cooler temperatures this year likely reduced water stress on oaks and helped to mitigate drought impacts on acorn production. This year's decline in white oak acorn production compared to last year at state and regional scales could be associated with drier conditions in 2014, since white oak species flower and produce acorns in a single

season. Red oaks, on the other hand, take two seasons to produce acorns. Therefore, the gain in red oak acorn production observed in 2014 could be associated with milder weather since the spring of 2013.

Based on these findings, there could be an above-average acorn crop available for Missouri's wildlife this fall and winter. A recent investigation found that legal harvest of deer during Missouri's fall firearm season was significantly lower in years of above-average acorn production compared to below-average production years. Although the difference was not statistically significant, numbers of legally harvested turkey taken in the fall season also declined in years of above-average acorn crops. Although numerous factors affect harvest, this suggests that fall season harvests of deer and turkey could be lower this year in parts of the state where acorns are the primary food item. However, the same investigation found that deer and turkey recruitment increased the year after an above-average crop suggesting that hunters may enjoy larger deer and turkey populations in years to come.

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